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Environmental Radioactivity in the Faroes in 1969

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A. Aarkrog and J. Lippert

The Danish Atomic Energy Commission
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Health Physics Department

Abstract

Measurements of fall-out radioactivity in the Faroes in 1969 are presented. Sr-90 (and Cs-137 in most instances) was determined in regularly collected samples of precipitation, grass, milk, lamb, fish, bread, and drinking water. In addition, analyses of spot samples of potatoes, sea water, sea plants, birds, vegetables, eggs, and human bone were carried out. Estimates of the mean contents of Sr-90 and Cs-137 in the human diet in the Faroes in 1969 are given.

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CONTENTS

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Our special thanks are due to the staff of the pharmacy "Tjaldur" in Thorshavn and to all other persons in the Faroes who have contributed collecting samples.

ABBREVIATIONS AND UNITS

FP	fission products
pCi	picocurie, 10^{-12} Ci, $\mu\mu$Ci
nCi	nanocurie, 10^{-9} Ci, mμCi
mCi	millicurie, 10^{-3} Ci
MPC	maximum permissible concentration
S. U.	pCi Sr-90/g Ca
O. R.	Observed ratio
M. U.	pCi Cs-137/g K
n Sr	natural (stable) Sr
S. D.	standard deviation, $\sqrt{\frac{\Sigma(x-x_i)^2}{(n-1)}}$
S. E.	standard error, $\sqrt{\frac{\Sigma(x-x_i)^2}{n(n-1)}}$
S. S. D.	sum of squares of deviations, $\Sigma(x-x_i)^2$
f	degrees of freedom
s^2	variance
v^2	ratio between the variance in question and the residual variance
P	probability of the distribution in question
$\bar{x}$	mean values
Σ	sum
η	coefficient of variation

1. INTRODUCTION

1.1.

The fall-out programme for the Faroes, which was initiated in 1962[1] in close co-operation with the National Health Service and the chief physician of the Faroes, was continued in 1969. A few samples of human bone were obtained in 1969 from Dronning Alexandrines Hospital in Thorshavn.

1.2.

The present report will not repeat information concerning sample collection and analysis already given in Risø Reports Nos. 64, 86, 108, 131, 155, 181[1], and 202.

1.3.

The mean diet of the Faroese as used in this report is unchanged as compared with 1962, i.e., it is still based on the estimate given by Professor E. Hoff-Jørgensen, Ph.D., nutritional consultant to the Danish Atomic Energy Commission.

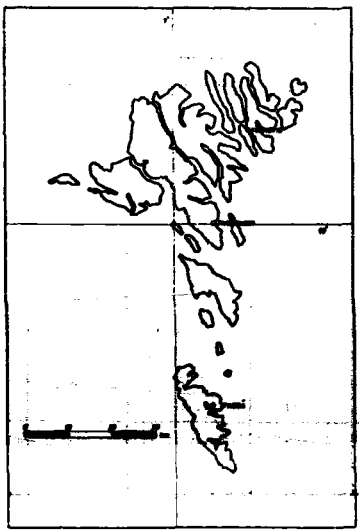

Fig. 2.1.1. The Faroes.

1.4.

The present investigation was carried out along with corresponding examinations of fall-out levels in Denmark and Greenland, described in Risø Reports Nos. 220[2] and 222[3] respectively.

2. RESULTS AND DISCUSSION

2.1. Sr-90 in Precipitation

Table 2.1 shows the Sr-90 content in precipitation collected at Høyvig (near Thorshavn) and Klaksvig in 1969. The amount of precipitation at Klaksvig was a factor of 1.5 greater than that found at Høyvig, and the amount of fall-out at Klaksvig was 1.6 times that measured at Høyvig.

The mean specific activity of Sr-90 in precipitation in 1969 was approx. equal to the 1968 level in the Faroes and so was the mean fall-out.

Table 2.1

Sr-90 in precipitation from the Faroes in 1969

Month	Høyvig		Klaksvig	
	pCi Sr-90/l	mCi Sr-90/km^2	pCi Sr-90/l	mCi Sr-90/km^2
Jan.	0.58	0.077	0.56	0.104
Feb.	1.07	0.049	1.26	0.183
Mar.	1.27	0.086	1.22	0.134
Apr.	1.43	0.174	1.50	0.158
May	1.33	0.074	1.76	0.264
June	1.07	0.051	2.33	0.116
July	1.22	0.058	2.04	0.102
Aug.	1.93	0.088	2.03	0.089
Sep.	1.12	0.168	1.49	0.130
Oct.	0.76	0.145	1.04	0.191
Nov.	0.58	0.027	0.50	0.152
Dec.	2.44	0.116	2.49	0.122
1969	$\bar{x}$ 1.11	$\frac{\Sigma}{1000}$ mm 1.11	$\bar{x}$ 1.39	$\frac{\Sigma}{1463}$ mm 1.76

Table 2.2

Sr-90 and Cs-137 in grass from Thorshavn 1969

Month	pCi Sr-90/g ash	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K	Cs-137/Sr-90
June	17.8	158	520	366	144	2.3
Aug.	10.9	132	332	194	49	1.5

2.2. Sr-90 and Cs-137 in Grass

Grass samples were collected near Thorshavn in 1969 as in the previous years. Table 2.2 shows the results. The mean S.U. content of the grass during the summer months was estimated at 425 S.U., and the mean S.U. in milk during June-September was 41 S.U. at Thorshavn (cf. 2.3), i.e. the observed ratio between S.U. in milk and in grass was 0.10 (0.09 in 1968 and 1967, 0.07 in 1966, and 0.14 in 1965). The 1969 S.U. levels in grass were only two thirds of the 1968 levels. As compared with Danish grass in 1969[2], we found the S.U. levels in the Faroese grass to be higher by a factor of approx. 8 in the summer months. The mean content of Cs-137 during the summer months was 0.28 nCi Cs-137/kg or 97 M.U., i.e. one third of the 1968 levels.

The mean ratio between Cs-137 and Sr-90 in the grass (pCi/kg) was 1.9 (S.D.: 0.4), the ratio was 1.4 in 1968, 1.9 in 1967, 2.0 in 1966, and 1.8 in 1965.

2.3. Sr-90 and Cs-137 in Milk

As in the previous years[1], fresh milk samples collected weekly were obtained from Thorshavn, Klaksvig and Tværå. Sr-90 and Cs-137 were determined in bulked monthly samples.

Table 2.3.1 shows the results and tables 2.3.3 - 2.3.4 the analysis of variance of the S.U., M.U. and pCi Cs-137/l figures respectively. The variation between months was not significant either for Cs-137 or for Sr-90. As also observed in 1967 and 1968, the variation between locations was significant for Cs-137, but not significant for Sr-90. The highest Cs-137 levels were found in the milk from Klaksvig and Tværå and the lowest in the Thorshavn milk.

Fig. 2.3.1 shows the quarterly S.U. values and fig. 2.3.2 the quarterly pCi Cs-137/l levels since 1962. The annual mean values for 1969 were 35 S.U. (~42 pCi Sr-90/l) and 260 M.U. or 468 pCi Cs-137/l, i.e. the 1969

Table 2.3.1

Sr-90 and Cs-137 in milk from the Faroes in 1969

	Thorshavn			Klaksvig			Tværå			Mean		
	S.U.	pCi Cs-137/l	M.U.	S.U.	pCi Cs-137/l	M.U.	S.U.	pCi Cs-137/l	M.U.	S.U.	pCi Cs-137/l	M.U.
Jan.	35±1	235	109	27±0	488	201	34±2	204	255	32	309	188
Feb.	32±3	206	126	26±2	440	226	34±2	446	217	31	364	190
Mar.	24±5	229	103	32±1	603	303	28±1	441	244	28	424	217
Apr.	25	234	122	22	594	280	30	673	333	26	500	245
May	23	335	173	35	534	333	21	654	291	26	506	266
June	24	(405)	214	50	(527)	285	40	(510)	307	38	481	269
July	43	408	216	58	489	222	37	778	391	46	558	276
Aug.	44	603	379	45	303	273	47	866	857	46	591	503
Sept.	54	234	131	38	388	235	38	663	388	43	422	251
Oct.	31	140	74	38	474	243	56	850	407	41	488	241
Nov.	37	514	211	32	637	283	28	321	153	32	491	216
Dec.	26	155	99	27	529	348	35	564	344	29	416	264
Mean	33	308	163	36	499	269	36	581	349	35	463	260

Table 2.3.2

Analysis of variance of ln pCi Sr-90/g Ca in milk 1969
(from table 2.3.1)

Variation	SSD	f	s^2	v^2	P
Betw. locations	0.0618	2	0.0309	0.63	-
Betw. months	1.5977	11	0.1452	3.01	> 97.5%
Loc. x months	1.0700	22	0.0486	2.81	-
Remainder	0.1386	8	0.0173		
η = 0.14					

Table 2.3.3

Analysis of variance of ln pCi Cs-137/g K in Faroese milk in 1969
(from table 2.3.1)

Variation	SSD	f	s^2	v^2	P
Betw. locations	3.9966	2	1.9983	17.50	> 99.95%
Betw. months	2.0634	11	0.1873	1.64	-
Remainder	2.5156	22	0.1143		
η = 0.35					

Table 2.3.4

Analysis of variance of ln pCi Cs-137/l milk in 1969
(from table 2.3.1)

Variation	SSD	f	s^2	v^2	P
Betw. locations	3.9818	2	1.9909	11.77	)99.95%
Betw. months	1.3623	11	0.1150	-	-
Remainder	3.7275	22	0.1694		
η = 0.43					

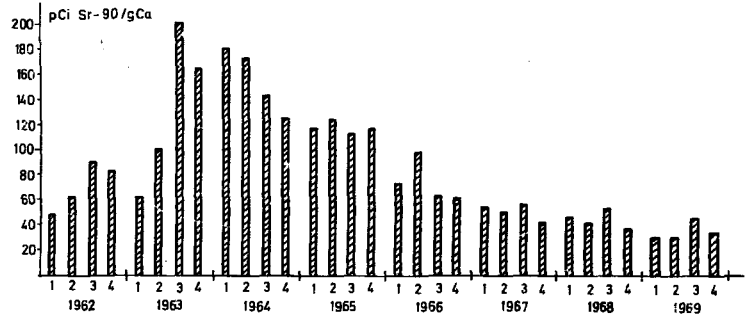

Fig. 2.3.1. Sr-90 in Faroese milk, 1962-69.

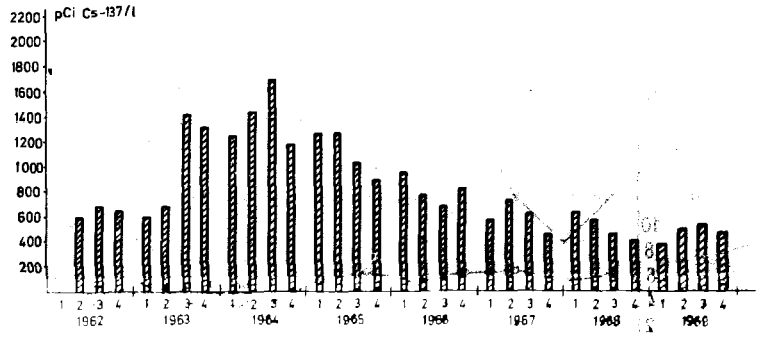

Fig. 2.3.2. Cs-137 in Faroese milk, 1962-69.

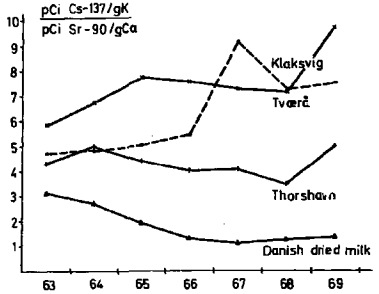

Fig. 2.3.3. $\frac{\text{M.U.}}{\text{S.U.}}$ ratios in Faroese and Danish milk, 1963-69.

Sr-90 level was approx. 80% and the Cs-137 level approx. 90% of the 1968 mean levels. (The predicted levels in Faroese milk from 1969 were 42 S. U. and 277 M. U.[6], i. e. a little higher than those observed).

The annual mean values of the M. U./S. U. ratio in Faroese milk are shown in fig. 2.3.3.

The mean ratio in 1969 was 7.7 during the grazing period (May-October), and in the winter time it was 7.2. This is in agreement with the observations in 1966, 1967, and 1968[1].

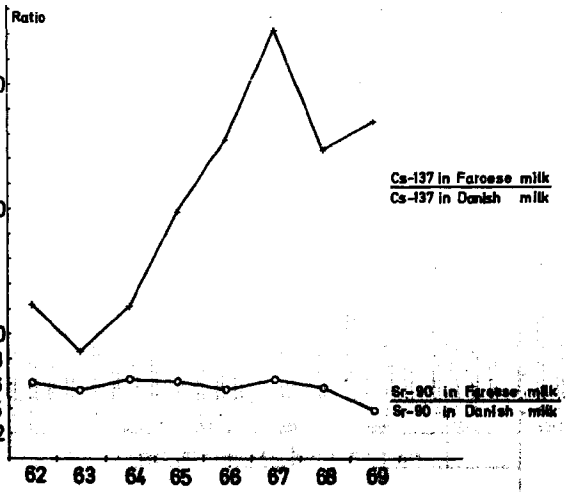

Fig. 2.3.4. A comparison between Faroese and Danish milk levels, 1962-69.

Fig. 2.3.4 shows a comparison between the Sr-90 and Cs-137 levels in Faroese- and Danish-produced milk. It is evident that the soil uptake plays an important role in the Faroes, especially for the Cs-137 levels.

2.4. Sr-90 and Cs-137 in Terrestrial Animals

Fresh lamb's meat was collected in August, October, November and December 1969.

The mean levels were 77 pCi Sr-90/kg or 278 S.U. and 2.6 nCi Cs-137/kg or 690 M.U. The mean bone level was 252 pCi Sr-90/g Ca.

Table 2.4

Sr-90 and Cs-137 in sheep samples from the Faroes 1969

Sampling Month	Sample type		pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
Aug.	Fresh	Meat	33	47	0.62	263
Aug.		Bone	-	$41^{+}_{-}1$	-	-
Oct.	Dried	Meat	46	112	1.09	286
Oct.		Bone	-	$147^{+}_{-}4$	-	-
Nov.	Dried	Meat	87	512	6.57	1730
Nov.		Bone	-	$528^{+}_{-}29$	-	-
Dec.	Dried	Meat	142	432	2.01	470
Dec.		Bone	-	$291^{+}_{-}9$	-	-

2.5. Sr-90 and Cs-137 in Sea Animals

Table 2.5.1 shows the Sr-90 and Cs-137 levels in fish and sea birds collected in 1969 in the Faroes. The mean levels in fish were 0.46 pCi Sr-90/kg (S.D.: 0.6) and 11 pCi Cs-137/kg (S.D.: 10). The Faroese fish levels were lower than the Danish (3 times as low for Sr-90 and 7 times for Cs-137)[2].

Table 2.5.1

Sr-90 and Cs-137 in sea animals from the Faroes in 1969

Sampling Month		Species	Sample type	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
Jan.	Fish	Gadus callarias	Meat	0.33±0.07	3.4±1.2	2.1	0.9
Jan.	"	Gadus aegle finus	Meat	0.24±0.10	1.7±0.4	15.8	5.1
Mar.	"	Gadus callarias	Meat	1.8 ±0.5	10±3	37.1	15.0
Mar.	"	Gadus aegle finus	Meat	0.18±0.05	2.0±0.5	7.6	3.5
May	"	Gadus callarias	Meat				
May	"	Gadus aegle finus	Meat	-	8.8	8.0	3.7
Sept.	"	Gadus callarias	Meat	0.19±0.07	1.6±0.8	7.3	3.5
Sept.	"	Gadus aegle finus	Meat	0.40	4.4	6.7	3.6
Nov.	"	Gadus callarias	Meat	0.25±0.04	2.9±0.4	5.3	2.3
Nov.	"	Gadus aegle finus	Meat	0.14±0.05	2.3±1.2	9.7	5.5
Mean	"	Gadus callarias	Meat	0.64	4.5	13	5.4
	"	Gadus aegle finus	Meat	0.24	2.6	10	4.4
June	Bird	Fratercula arctica	Meat	-	0.13	-	-

2.6. Sr-90 in Drinking Water and Fresh Water

Drinking-water samples were collected as previously[1]. Table 2.6.1 shows the results and table 2.6.2 the analysis of variance. As in the previous years the drinking water from Thorshavn contained more Sr-90 than that from Tværå (cf. the explanation in Risö Report No. 181[1]).

Fig. 2.6.1 shows the two-monthly mean levels of Sr-90 in drinking water from the three locations since 1962.

The mean level in 1969 was 0.28 pCi Sr-90/l, i.e. 75% of the 1968 level.

Table 2.6.1

Sr-90 in drinking water from the Faroes in 1969
pCi Sr-90/l

Month	Thorshavn	Klaksvig	Tværå
Jan.	0.26	0.17	(0.24)
Mar.	0.35	(0.17)	(0.29)
May	0.20	0.16	(0.22)
July	0.42	0.08	0.23
Sep.	0.39	0.23	(0.35)
Nov.	0.58	0.22	0.39
1969	0.37	0.17	0.29
Figures in brackets were estimated from VAR 3[7)]			

Table 2.6.2

Analysis of variance of the results in table 2.6.1

Variation	SSD	f	s^2	v^2	P
Betw. locations	1.4403	2	0.7202	4.84	-
Betw. months	0.8965	5	0.1793	1.21	
Remainder	0.7436	5	0.1487		
q = 0.40					

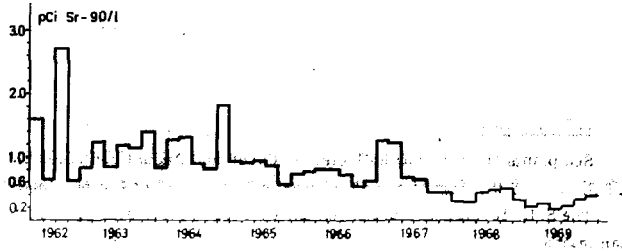

Fig. 2.6.1. Sr-90 in drinking water, 1962-69 (mean of Thorshavn, Klaksvig and Tværå).

2.7. Sr-90 and Cs-137 in Miscellaneous Samples

2.7.1. Soil

No soil samples were collected in 1969 from the Faroes. From earlier years' observations we estimate the accumulated fall-out at Thorshavn at 68 mCi Sr-90/km^2 and that at Klaksvig at 136 mCi Sr-90/km^2.

2.7.2. Sea Water

Surface sea water was collected near Thorshavn in August. The Sr-90 level was 0.17 pCi Sr-90/l (salinity: 35.4 o/oo).

As shown in fig. 2.7.2, the Sr-90 concentration in the sea water collected at the Faroes in 1969 was higher than in 1968, but nearly equal to the 1967 level.

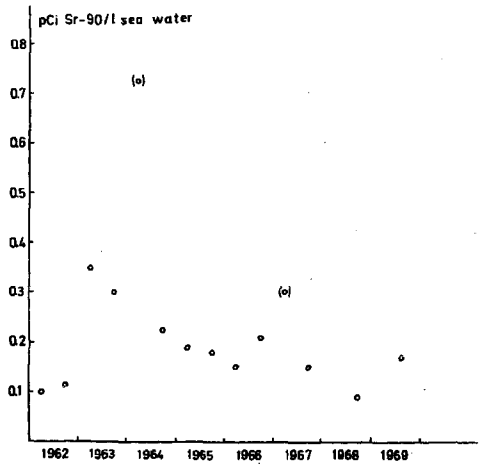

Fig. 2.7.2. Sr-90 in Faroese sea water, 1962-69.

2.7.3. Sea Plants

Sea plants (Laminaria) collected in March and August contained 2.7 and 8.9 S.U., and the August sample showed a M.U. level of 1.5 pCi Cs-137/g K.

The S.U. levels were in agreement with last year's observations for Laminaria.

Table 2.7.4

Sr-90 and Cs-137 in potatoes and other vegetables from the Faroes in 1969

Sampling month	Species	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
Aug.	Carrots	24	47	9.5	4.2
Aug.	Cauliflower	1.2	18.7	19.5	5.9
Aug.	Beets	8.0	31.5	-	-
Nov.	Beets	56	145	69	16
Dec.	Potatoes	8.9	399	456	173

2.7.4. Potatoes and Other Vegetables

Potatoes were collected in December and cauliflower, beets and carrots in August. Table 2.7.4 shows the results of the Sr-90 and Cs-137 determinations.

The Sr-90 level in potatoes was 8.9 pCi/kg, i.e. a little lower than in 1968. The Cs-137 mean level was 456 pCi Cs-137/kg or somewhat higher than the 1968 level.

The Cs-137 levels in cauliflower and carrots collected in 1969 were higher than the levels found in Denmark[2], while the Sr-90 levels were nearly equal to the Danish levels. This is in agreement with the observations made in the previous years.

2.7.5. Bread

As in the previous years[1], rye bread and white bread were collected in Thorshavn in June and December 1969. The mean levels in white bread were 2.1 pCi Sr-90/kg and 10.5 pCi Cs-137/kg, i.e. half the 1968 levels. The rye bread collected in 1969 contained on the average 16 pCi Sr-90/kg and 11 pCi Cs-137/kg, i.e. the Cs-137 contents were approx. one third of the 1968 levels, while the Sr-90 level was nearly equal to that of 1968. The Faroese bread levels were as previously significantly lower than the Danish[2].

Table 2.7.5

Sr-90 and Cs-137 in Faroese bread in 1969

Month	Sort	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
June	White bread	2.14	2.9	15.6	14.4
June	Rye bread	17±4	10.8±0.5	25.7	12.6
Dec.	White bread	2.05	6.7	8.1	7.4
Dec.	Rye bread	16	19.7	28.4	12.2

Table 2.7.6

Sr-90 and Cs-137 in Faroese eggs in 1969

Month	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
June	1.3	2.7	4.6	3.8
Dec.	3.2	6.6	3.1	3.8

2.7.6. Eggs

Eggs were collected from Thorshavn in June and December 1969. Table 2.7.6 shows the results. The levels were lower than in 1968.

2.8. Humans

In 1969 a number of human vertebrae samples were obtained from Dronning Alexandrines Hospital in Thorshavn. Table 2.8 shows the results. As compared with Danish bone levels in 1969[2] the Faroese levels in newborn bone were approx. four times as high and in adults three times as high. In the period 1962-69 the ratio between S.U. in Faroese total diet and in Danish diet was 2.34 (S.D.: 0.34, S.E.:0.12), while the ratio between S.U. in milk from the two countries was 5.9 (S.D.: 0.7, S.E.: 0.2) (cf. fig. 2.3.4). The ratio between Sr-90 in deciduous teeth from the Faroes and Denmark[5] is approx. 4. Hence the Faroese bone levels were in agreement with what could be expected.

A single whole-body measurement was carried out on a 51-year old man from the Faroes. The measurement showed 19.1 nCi Cs-137 or 115 pCi Cs-137/g K. His weight was 79 kg and his height 177 cm. As compared with the Danish whole-body levels in 1969[2] the Faroese were nearly three times as high; this is, however, lower than expected from the diet estimates (cf. 3.11).

Sr-90 in human vertebrae collected in the Faroes in 1969

Age	Month of death	Sex	pCi Sr-90/g Ca	Sample No.
1 day	2	m	1.21	MK 6
1 day	10	m	13.1	MK 102
1 day	10	m	4.02	MK 103
48 years	10	m	4.69	MK 104
66 years	11	f	3.47	MK 130
82 years	10	m	3.40	MK 106
83 years	11	f	2.26	MK 131

3. ESTIMATE OF THE MEAN CONTENTS OF Sr-90 AND Cs-137 IN THE HUMAN DIET

3.1. Annual Quantities

As in 1962[1], the annual quantities are based on the estimate made by Professor E. Hoff-Jørgensen, Ph.D., on the assumption of a daily per capita intake of approx. 3000 calories.

3.2. Milk and Cream

75% of the milk consumed in the Faroes is assumed to be of local origin, and 25% comes from Denmark. Hence the Sr-90 content in milk consumed in the Faroes in 1969 was $1.2 \cdot (0.75 \cdot 35 + 0.25 \cdot 7.2) = 34$ pCi Sr-90/kg, and the Cs-137 content was $0.75 \cdot 463 + 0.25 \cdot 16 = 351$ pCi Cs-137/kg (cf. 2.3 and ref. 2). 1 kg milk contains 1.2 g Ca.

3.3. Cheese

Nearly all cheese consumed in the Faroes is of Danish origin, and the Danish figures from ref. 2 were used: 61 pCi Sr-90/kg and 12 pCi Cs-137/kg.

3.4. Grain Products

As most grain products are imported from Denmark, the Danish figures for 1969[2] were used in the calculation of the Faroese levels. The mean daily consumption of grain products in the Faroes is, as in Denmark, 80 g rye flour, 120 g wheat flour and 20 g grits. Hence the mean concentration of Sr-90 in grain products consumed in the Faroes in 1969 becomes 23 pCi Sr-90/kg and 48 pCi Cs-137/kg. We realize (cf. 2.7.5) that these activity figures may overestimate the actual intake of Sr-90 from grain products in the Faroes.

3.5. Potatoes

All potatoes consumed in the Faroes are assumed to be of local origin. The values obtained from table 2.7.4 were used, i.e. 8.9 pCi Sr-90/kg and 456 pCi Cs-137/kg.

3.6. Other Vegetables and Fruit

As the amount of vegetables and fruit grown in the Faroes is limited, the Danish figures from 1969[2] were used. Thus the mean contents in vegetables other than potatoes were 13 pCi Sr-90/kg and 6 pCi Cs-137/kg, and the mean contents in fruit were 4 pCi Sr-90/kg and 12 pCi Cs-137/kg.

3.7. Meat and Eggs

The meat and egg consumption in the Faroes is estimated to consist of 50% locally produced mutton (or lamb's meat), 25% local whale meat and 25% sea birds and eggs.

The mutton contained 77 pCi Sr-90/kg and 2.6 nCi Cs-137/kg (cf. 2.4). No samples of whale meat were obtained in 1969, but we estimate the activity level to have been equal to that of fish meat, i.e. 0.46 pCi Sr-90/kg and 11 pCi Cs-137/kg, and for the sea birds and eggs taken from 2.7.6: 2 pCi Sr-90/kg (cf. 2.5.1) and 4 pCi Cs-137/kg.

Hence we estimate the mean content of Sr-90 in meat and eggs consumed in 1969 to be

$$0.50 \cdot 77 + 0.25 \cdot 0.46 + 0.25 \cdot 2 = 39 \text{ pCi Sr-90/kg}$$

and the Cs-137 content to be

$$0.50 \cdot 2.6 + 0.25 \cdot 0.011 + 0.25 \cdot 0.004 = 1.30 \text{ nCi Cs-137/kg.}$$

3.8. Fish

All fish consumed in the Faroes is of local origin, and the mean contents in fish, obtained from subsection 2.5, were 0.46 pCi Sr-90/kg and 11 pCi Cs-137/kg.

3.9. Coffee and Tea

The Danish figures for 1969[2] were used, i.e. 27 pCi Sr-90/kg and 168 pCi Cs-137/kg.

3.10. Drinking Water

The mean value found in table 2.6 was used, i.e. 0.28 pCi Sr-90/l. The Cs-137 content was estimated to be approx. one fourth (the ratio found in New York tap water in 1964[4]) of the Sr-90 content, i.e. 0.1 pCi Cs-137/l.

Tables 3.1 and 3.2 show the estimates of Sr-90 and Cs-137 respectively.

3.11. Discussion

Fig. 3 shows the Faroese diet levels since 1962.

The 1969 levels in total diet were three fourths of the 1968 levels.

The main contributors of the Sr-90 content in the Faroese diet were milk products, cereals and meat, which together accounted for 85% of the total Sr-90 content in the diet in 1969. As regards Cs-137, milk products, meat (lamb), and potatoes were the most important contributors. In 1969, 95.5% of the total Cs-137 content in the diet came from these products.

The Faroese mean diet contained nearly two times as much Sr-90 and approx. ten times as much Cs-137 as the Danish 1969 diet[2].

Table 3.1

Estimate of the mean content of Sr-90 in the human diet in the Faroes in 1969

Type of food	Annual quantity in kg	pCi Sr-90 per kg	Total pCi Sr-90	Percentage of total Sr-90 in food
Milk and cream	146	34	4964	48.6
Cheese	7.3	61	445	4.4
Grain Products	80	23	1840	18.0
Potatoes	91	8.9	810	7.9
Vegetables	20	13	260	2.5
Fruit	18	4	72	0.7
Meat and eggs	37	39	1443	14.1
Fish	91	0.46	42	0.4
Coffee and tea	7.3	27	197	1.9
Drinking water	548	0.28	153	1.5
Total			10226	

The mean annual calcium intake is estimated to be 600 g (approx. 200-250 g of creta praeparata). Hence the pCi Sr-90/g Ca ratio in the total Faroese diet was 17 S.U., and the mean daily intake was 28 pCi Sr-90/day.

Table 3.2

Estimate of the mean content of Cs-137 in the human diet in the Faroes in 1969

Type of food	Annual quantity in kg	pCi Cs-137 per kg	Total pCi Cs-137	Percentage of total Cs-137 in food
Milk and cream	146	351	51246	34.8
Cheese	7.3	12	88	0.1
Grain Products	80	48	3840	2.6
Potatoes	91	456	41496	28.1
Vegetables	20	6	120	0.1
Fruit	18	12	216	0.2
Meat and eggs	37	1300	48100	32.6
Fish	91	11	1001	0.7
Coffee and tea	7.3	168	1226	0.8
Drinking water	548	0.1	55	0.0
Total			147388	

The mean annual intake of potassium is estimated to be approx. 1200 g. Hence the pCi Cs-137/g K ratio becomes 123 M. U. and the daily intake of Cs-137 403 pCi.

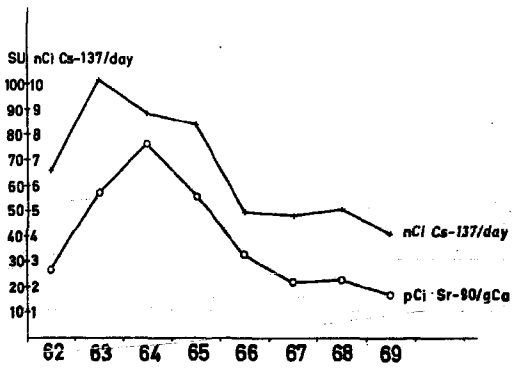

Fig. 3. Sr-90 and Cs-137 in Faroese diet 1962-69.

4. CONCLUSION

4.1.

The Sr-90 fall-out rate in the Faroes in 1969 was approx. 1.4 mCi Sr-90/km^2. The accumulated fall-out by the end of 1968 was estimated at approx. 102 mCi Sr-90/km^2 (the mean of Thorshavn and Klaksvig).

4.2.

The mean level of Sr-90 in Faroese milk was 35 S.U. or 42 pCi Sr-90/l. The Cs-137 concentration was 260 pCi Cs-137/g K, or 463 pCi Cs-137/l.

Potatoes contained 8.9 pCi Sr-90/kg and 456 pCi Cs-137/kg. Lamb contained 77 pCi Sr-90/kg and 2.6 nCi Cs-137/kg. Fish showed mean levels of 0.5 pCi Sr-90/kg and 11 pCi Cs-137/kg.

The mean content of Sr-90 in drinking water was 0.28 pCi/l.

The mean daily per capita intakes with the diet in the Faroes in 1969 were estimated at 28 pCi Sr-90 (17 S.U.) and 403 pCi Cs-137 (123 pCi Cs-137/g K), i.e. three fourths of the 1968 levels.

4.3.

From the Faroese and Danish diet estimates and from measurements on deciduous teeth[5] and Faroese and Danish bones, the Faroese bone levels in 1969 were estimated as follows: in new-born children: approx. 4 S.U.; in infants (1 month - 4 years): approx. 10 S.U. (depending upon the amount of locally produced milk in the diet of the infants); in children and teen-agers (5 - 19 years): approx. 7 S.U.; in adult vertebrae: approx. 3.5 S.U.

The mean content of Cs-137 in the Faroese adult was estimated at approx. 50 nCi or approx. 400 pCi Cs-137/g K. This estimate was based on the Faroese and Danish diet estimated in 1969 and on Danish whole-body measurements. A single measurement of a Faroese man showed 19 nCi Cs-137 in total body and 115 pCi Cs-137/g K.

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